OCEAN DUMPING PERMIT PROGRAM
Basis of Determination
E.I. DuPont de Nemours and Company, Inc.
Edge Moor Plant
Permit No. II-DE-138-Special

Background

The U.S. Environmental Protection Agency (EPA) has received a complete application from the E.I. duPont de Nemours and Company, Inc., Edge Moor Plant, Edge Moor, Delaware for renewal of their permit to transport and dispose of aqueous acid iron waste into ocean waters under the Marine Protection, Research, and Sanctuaries Act (MPRSA) of 1972, 33 U.S.C. 1401-1444 (1976).

EPA has made a tentative determination to issue a special permit (for a term of three years) to DuPont in accord with provisions of the MPRSA and regulations and criteria issued pursuant thereto, found at 40 CFR 220-229 (Supp. 1977). The applicant has practiced ocean disposal of aqueous acid iron waste at the Deepwater Industrial Waste Disposal Site for a number of years. The applicant's previous ocean dumping permit (No. II-DE-138 Special) expires June 30, 1987.

SUMMARY OF INFORMATION

- Applicant

E.I. duPont de Nemours and Company, Inc.
John S. Kloss, Plant Manager
Edge Moor Plant
Edge Moor, Delaware 19809

- Type of Waste

Aqueous solution of acid iron and miscellaneous chlorides.

- Proposed Waste Transporters

Compass Marine Corporation
203 Cricket Lane
Wallingford, Pennsylvania 19806

- Proposed Waste Generators

E.I. duPont de Nemours and Company, Inc.
Edge Moor Plant
Edge Moor, Delaware 19809

- Proposed Means of Conveyance

Edge Moor I; barge;
registry 011924

- Volume of Waste to be Disposed

Not more than 225,000 wet tons over the term of the permit. No more than 125,000 wet tons may be disposed during any 12-month period.

- Proposed Dumpsite

The Deepwater Industrial Waste Disposal site (formerly known as 106-mile Site) is located approximately 105 nautical miles offshore of Atlantic City, New Jersey. The site is a circular area with radius 3.0 nautical miles with center coordinates:

Latitude: 38° 45'00" N
Longitude: 72° 20'00" W

Summary of Tentative Special Conditions to be Imposed by EPA

1. Permit Term - Not to exceed three years from effective date.

2. Description of Material - As described above.

   Dupont shall submit quarterly reports (on a calendar basis) summarizing the volumes ocean dumped under this permit. DuPont shall also submit the volumes of waste produced and the volume of waste sold.

3. Disposal Site - Transportation for the purpose of ocean dumping shall terminate at, and waste disposal shall be confined to, a circular area with a radius of 3.0 nautical miles with center coordinates 38°45'North and 72°20' West.

4. Method of Disposal - The waste transporter shall use only the barge Edge Moor I for transportation and disposal of authorized wastes. The discharge rate shall be restricted to 37,000 gallons per nautical mile. Vessel/barge traverses shall be at least 0.5 nautical miles apart. No vessel/barge shall commence discharge for at least four hours after the previous vessel/barge has terminated its discharge. Shiprider surveillance shall be conducted on each trip to the dumpsite. In the event that the Coast Guard does not provide such surveillance, DuPont shall provide an unbiased shiprider who will report to the Coast Guard.

5. Analysis of Authorized Wastes - Analyses shall be conducted monthly by DuPont on a representative sample of a barge load for a wide variety of organic and inorganic constituents, and biological parameters, and on each barge load for iron, acidity, and pH.

6. Monitoring - Dupont is required to implement an EPA approved monitoring plan.

7. Implementation Schedule - Requires the waste generator to evaluate on-site and off-site treatment of its waste as an alternative to ocean disposal. The schedule requires that specific alternatives to reduce the amount of waste for ocean disposal are evaluated and implemented.

8. Notice to Regulatory Agencies - Procedures for notifying the Coast Guard, and the Environmental Protection Agency are specified.

9. Reports and Correspondence - Procedures for submitting reports and related correspondence are specified.

10. Liability - General and special conditions for which the waste generator and waste transporters are liable are specified.

Subpart B - Environmental Impact Criteria (40 CFR Sec. 227.4 - 227.12 et. seq.)

Specific environmental impact prohibitions, limits, and conditions for the dumping of materials into ocean waters are specified in these regulations. Pursant to §227.4, if the applicable prohibitions, limits, and conditions are satisfied, it is the determination of EPA that the proposed disposal would not result in:

(a) Unacceptable adverse impacts on human health or significant damage to marine resources.

(b) Unacceptable adverse effects on the marine ecosystem.

(c) Unacceptable adverse persistent or permanent effects due to either the dumping or particular volumes or the concentration of these materials.

(d) Unacceptable adverse effects on the ocean for other uses as a result of direct environmental impacts.

Sec. 227.5 - Prohibited Materials

No high level radioactive wastes (as defined in §227.30); no radiological, chemical, or biological warfare wastes; no insufficiently described materials; no persistent inert synthetic materials; or no natural materials which may float or remain in suspension in the ocean shall be permitted to be disposed at sea or otherwise introduced into the marine environment. The composition and properties of all phases of Edge Moor wastewater have been biologically and chemically analyzed. For example:

(a) Representative samples of wastewater from numerous barge loads underwent a waste characterization analysis to determine the concentrations of various metals, pH, petroleum hydrocarbons, oil and grease, and other parameters.

(b) The toxicity of numerous samples of whole waste, suspended particulate, and liquid phases, to several appropriate sensitive organisms (algae, mysid shrimp, fish) was tested through EPA-approved bioassay procedures.

(c) Monitoring of dumping activities was conducted on numerous occassions to measure constituents in-situ and to establish the dispersion of wastes following an actual dump under conditions least likely to enhance mixing.

Based upon these analyses, it is concluded that the wastewater contains no high-level radioactive wastes or warfare agents, persistent inert materials or floatable materials. These data sufficiently describe Edge Moor wastewater for use in evaluating environmental impact.

Sec. 227.6 - Constituents Prohibited As Other Than Trace Contaminants

This section prohibits ocean disposl of waste containing any of the following constituents in other than trace amounts or in amounts that would not be rendered rapidly harmless in the marine environment:

(a) Organohalogen compounds
(b) Mercury and mercury compounds
(c) Cadmium and cadmium compounds
(d) Oil of any kind or in any form
(e) Known or suspected carcinogens, mutagens, or teratogens.

(a) Organohalogen Compounds - Because of the presence of ferrous iron in the wastewater, no residual chlorine remains to form organohalogen compounds. Evaluation of Edge Moor wastewater has indicated that no organohalogen compounds are present at the disposal site following disposal of Edge Moor wastewater.

(b) Mercury and Mercury Compounds - Mercury concentrations at the disposal site following disposal of Edge Moor wastewater and after allowance for initial mixing (four hours), do not exceed the average normal ambient concentration by more than 50%. This has been demonstrated by measuring mercury concentrations during plume dispersion and by estimating mercury concentrations after initial mixing under assumed conditions least likely to enhance dispersion (i.e. low wind, calm seas, shallow thermocline during summer months; dilution factor 50,000:1). Mercury in the solid phase of the wastewater does not exceed the interim criterion of 0.75 mg/kg (40 CFR 227.6(e)(1)). Bioassay results on the suspended particulate phase do not indicate significant mortality or sublethal effects, including bioaccumulation.

(c) Cadmium and cadmium compounds - Cadmium concentrations at the disposal site following disposal of Edge Moor wastewater, and after allowance for initial mixing, do not exceed applicable marine water quality criteria (43 ug/l 1-hour average; 9.3 ug/l 4-day average). This has been demonsrated by measuring cadmium concentrations during plume dispersion and by estimating cadmium concentrations after initial mixing under assumed conditions least likely to enhance dispersion. Cadmium in the solid phase of the wastewater does not exceed the interim criterion of 0.6 mg/kg (40 CFR 227.6 (e)(1)). Bioassay results do not indicate significant mortality or sublethal effects, including bioaccumulation.

(d) Oil of any kind or in any form - Concentrations of oil and grease and petroleum hydrocarbons in Edge Moor wastewater have been measured and shown not to exceed available state water quality standards after allowance for initial mixing (State of Alaska standard for hydrocarbons in marine waters is 15 ug/l for growth and propagation of aquatic life). No visible slick or sheen has been observed following disposal of Edge Moor wastewater.

(e) Known or suspected carcinogens, mutagens or teratogens - The following trace constituents in Edge Moor wastewater are known or suspect carcinogens, mutagens, or teratogens: Arsenic, cadmium, copper, lead, nickel, and chromium. Cadmium was discussed above. Chromium is present only in the trivalent form, which is not considered to be carcinogenic, mutagenic, or teratogenic. For the remaining constituents, concentrations after allowance for initial mixing will not exceed marine water quality criteria.

Bioassays conducted on several species with liquid and suspended particulate phases have indicated that effects of the pH adjusted waste produces mortalities only at concentrations several orders of magnitude above the unaltered (whole) waste. Bioassays on whole waste, indicate a chronic no effect level for minnows (Menidia) and mysid shrimp in the range of 25-50 ppm. Initial mixing of waste under conditions least likely to enhance dispersion would reduce waste concentrations to 20 ppm. Chronic life-cycle tests conducted with whole waste using mysid shrimp and copepods have shown that the ratio of chronic to acute toxicity is much greater than the application factor used to establish the discharge rate. A series of tests examining the bioaccumulation potential of constituents in the wastewater exposed test organisms to a maximum of 140 ppm of suspended particulate phase for 10 days. The tests showed that no significant elevation in concentrations of waste constituents occured in tissues of test organisms. Thus chronic toxicity and bioaccumulation of the wastewater in the marine environment will not occur.

Sec. 227.7 - Limits Established for Specific Wastes or Waste Constituents - Ocean disposal of Edge Moor wastewater shall not result in the introduction into the marine environment of benzene, xylene, carbon disulfide, toluene, or other immiscible or slightly soluble constituents at concentrations above their solubility limits in seawater. Living organisms or biodegradable constituents which would depress normal ambient dissolved oxygen levels in the disposal area by more than 25% after initial mixing, and disposal of acid or alkaline waste which would change the average total acidity or alkalinity of the ocean water by more than 10% after initial mixing, are not authorized.

Analyses have demonstrated that wastewater does not contain immiscible liquid, radioactive material, or living organisms. Calculations based on conservative assumptions (i.e. maximum acidity of waste, minimum observed salinity of ocean water, oceanographic conditions least likely to enhance dispersion), and monitoring of waste plumes following disposal, have demonstrated that the alkalinity of ocean water is changed by less than 10% after initial mixing.

Oxidation of iron in Edge Moor wastewater represents a potential oxygen demand. Calculations based on conservative assumptions (i.e. reaction route leading to greatest oxygen demand, waste with maximum iron concentration, maximum ratio of $Fe^{+2}:Fe^{+3}$, minimum observed dissolved oxygen concentration in surface ocean waters at the site, conditions least likely to enhance dispersion) show that the dissolved oxygen concentration of ocean water after initial mixing will not be decreased by 25% or more.

Sec. 227.8 - Limitations on the Disposal Rates of Toxic Wastes - Ocean disposal of Edge Moor wastewater shall not exceed the limiting permissible concentration as defined by §227.27. For those constituents for which marine water quality criteria exist, the limiting permissible concentrations were not exceeded at the disposal rate set in the tentative permit. For those constituents which did not have applicable criteria, concentrations greater than 0.01 of the concentration shown to be acutely toxic to appropriate sensitive marine organisms were not exceeded. Since dispersion studies have indicated that suspended solids in the wastewater do not reach the bottom until the waste has been widely dispersed, if at all, the wastewater can be said to have no solid phase, and no appropriate benthic organisms can be defined.

Sec. 227.9 - Limitations on Quantities of Waste Materials - The quantity of Edge Moor wastewater authorized for ocean disposal shall be limited to prevent long-term damage to the environment or to amenities. The subject permit limits the quantity of waste to be disposed such that the wastewater dumped over long periods of time will not cause long-term damage to the environment or to amenities. Studies have shown that the probability of interaction between two or more barge loads is extremely low, and that effects on organisms, if any, will be confined to the immediate dump area.

Sec. 227.10 - Hazards to Fishing, Navigation, Shorelines, or Beaches - Edge Moor wastewater contains no solid material which would create a hazard to fishing or navigation. The disposal site is not known to be a major commercial or recreational fishing area. Studies have shown that even under oceanographic conditions most likely to present a potential threat to shorelines or beaches (i.e. entrainment of wastewater into a current which advects the wastewater generally to the southwest, nearer to shore) the likelihood of the wastewater reaching near any shoreline in measureable concentrations capable of causing any adverse impact, is extremely remote.

Sec. 227.11 - Containerized Wastes - Edge Moor wastewater is not containerized.

Sec. 227.12 - Insoluble Wastes - Edge Moor wastewater is not insoluble waste as described in Sec. 227.12(a).

Sec. 227.13 - Dredged Materials - Edge Moor wastewater is not dredged material.

Subpart C - Need for Ocean Dumping - (40 CFR §227.14 -227.16)

In granting this permit, the EPA has determined that there are presently no environmentally preferable, technically feasible and economically reasonable alternatives to disposing Edge Moor wastewater in the ocean, and that there are currently no feasible alternative treatment methods or improvements in process technology which could reduce quantities or concentrations of constituents in the waste. The EPA has determined that sufficient need has been demonstrated for the ocean disposal of Edge Moor wastewater to continue as a temporary disposal alternative.

Alternatives to ocean disposal include conversion to the chloride process, use of high grade vs. low grade ore, and sales of ferric chloride to reduce the amount of waste for ocean disposal; neutralization and landfill, deep-well injection, storage, discharge to inland waters, and incineration. Conversion from the sulfate to the chloride process, use of optimal blends of high grade vs. low grade ore, and sales of ferric chloride have been implemented by DuPont. This has reduced volumes of waste for disposal. DuPont is, however, unable to sell or even give away all of its waste. Neutralization and landfill is environmentally unsound relative to deepwater ocean disposal due in part to the need to discharge large volumes of effluent to the Delaware River with potential impact on important fisheries and also due to the need to landfill large volumes of sludge with the potential for leaching and contamination of groundwater. Deep-well injection would involve great cost and would entail potential impacts to groundwater. Also, it is doubtful whether suitable geological strata could be found in the region. It should be noted that deep-well disposal of waste classified as hazardous is strongly discouraged by state authorities. Discharge to inland waters is environmentally unsound due to the acidic nature of the untreated waste and large suspended solid load of neutralized waste. These could have adverse impact on fish and shellfish resources of the Delaware River. Storage is infeasible because there is not sufficient available land area contiguous to the site. Incineration is infeasible because the waste constituents are non-combustible. Detailed discussions of these options can be found in the attached recommendations submitted by EPA Region III.

Subpart D - Impact of the Proposed Dumping on Aesthetic, Recreational and Economic Values (40 CFR §227.17 - §227.19 et. seq.)

The assessment of the potential for impacts of Edge Moor wastewater on aesthetic, recreational, and economic values will be based on appropriate characteristics of the wastewater during movement from the disposal site to an area of significant recreational or commercial value. Consideration of the following specific factors indicate that adverse impacts will be negligible:

(a) The present and potential recreational and commercial use of areas which might be affected by the disposal of wastewater - The disposal site and adjacent waters are oceanic in nature. The site is not, nor has it ever been, important to commercial or recreational fishing, navigation, resource extraction, or any other use.

(b) Existing water quality in areas which might be affected by disposal of Edge Moor wastewater - The disposal site and adjacent waters will suffer no long-term change in water quality as a result of disposal of Edge Moor wastewater. All observed impacts have been short term, lasting only a few hours. Effects on water quality were discussed in detail in Subpart B, above.

(c) Applicable water quality standards - No agency has promulgated water quality standards for marine waters beyond the territorial limits of the U.S. All applicable marine water quality criteria are met after initial mixing of Edge Moor wastewater.

(d) Visible characteristics of the materials which result in aesthetic nuisance in recreational areas - The disposal site is little used for recreation. Suspended solids in Edge Moor wastewater are generally low, and any precipitates which form are not expected to be of aesthetic nuisance.

(e) Presence of pathogenic organisms which may cause a public health hazard - No pathogens are present in Edge Moor wastewater.

(f) Presence of toxic chemical constituents released in volumes which may affect humans directly - Edge Moor wastewater contains no such chemicals in volumes capable of causing a direct effect on humans. There is little potential for human contact with waste disposed at the Deepwater Industrial Waste Disposal site. Personnel involved in barge operation and sampling of the wastewater are fully instructed in the proper and safe handling of the low pH wastewater.

(g) Presence of chemical constituents which may be bioaccumulated or persistent and may have an adverse effect on humans directly or through food chain interactions - The results of bioaccumulation testing has indicated that no bioaccumulation of waste constituents occurs in the marine environment.

(h) Presence of any constituents which might significantly affect living marine resources of recreational or commercial value - There is no evidence of any effect of Edge Moor wastewater disposal on any living marine resources, including fish, birds, or mammals, other than potential temporary avoidance of the disposal area.

EPA concludes that an assessment of the impacts of disposal of Edge Moor wastewater at the Deepwater Industrial Waste Disposal Site on environmental, aesthetic, recreational, and economic values indicates:

1. Disposal of the wastewater has not and will not degrade the environmental quality of affected areas, and no significant adverse environmental impacts result from such disposal.

2. Ocean disposal of Edge Moor wastewater does not degrade other uses of the dumpsite or of adjacent ocean waters.

3. There is no land-based disposal alternative to ocean disposal, or alternative treatment process which will have less environmental impact. Some alternatives will be detrimental from an environmental and an economic perspective.

4. Continued ocean disposal will not result in a loss of recreational value (i.e. user-days), a loss of money to commercial fisheries, nor to the profitability of other commercial enterprises, or other uses of the ocean.

Subpart E - Impact of the Proposed Dumping on Other Uses of the Ocean (40 CFR §227.20 - 227.26 et. seq.)

EPA has considered the potential long-range effects of Edge Moor wastewater in relation to the long-range impacts of other disposal activities on uses of the ocean. The conclusion is that the long-range effects, considering interactions, are negligible. This is based on the following:

1. The wastewater is rapidly dispersed and individual barge loads are infrequent, such that interaction of barge loads is unlikely.

2. Interaction of Edge Moor wastewater with sewage sludge disposed at the Deepwater Municipal Sludge Disposal Site is unlikely because the two sites are 10 nautical miles apart, and advective water movement in the two sites is generally parallel. No interactions have ever been recorded.

3. The potential impact on sensitive marine organisms is negligible. The dump site is an extremely small area relative to the ranges of populations of marine organisms. Planktonic organisms, which are most likely to be affected by the wastewater in the short-term, grow rapidly, and thus given the present rate of dumping and dispersion, only a small percentage of the plankton community is ever exposed to the wastewater. Therefore, there are no effects on plankton populations.

An appraisal of the nature and extent of existing and potential uses of the Deepwater Industrial Waste Disposal Site and surrounding areas has indicated that the disposal of Edge Moor wastewater does not significantly interfere with other uses of the ocean. The following specific uses were considered:

(a) Commercial fishing in open ocean areas - A small amount of long-lining for swordfish and tuna is done near the site, however, the disposal area is not particularly important relative to adjacent ocean areas. Most commercially important species live and spawn above the continental shelf, and consequently most commercial fishing is done there.

(b) Commercial fishing in coastal areas - The likelihood that wastewater could be advected into coastal areas rapidly enough so that constituent concentrations could have any effect is extremely small.

(c) Commercial fishing in estuarine areas - The probability of effects on estuarine fisheries is even more remote than for coastal fisheries.

(d) Recreational fishing in open ocean areas - Recreational fishing in open ocean areas is of lower frequency than commercial fishing, and the likelihood of any effect of Edge Moor wastewater disposal is extremely remote.

(e) Recreational fishing in coastal areas - The likelihood of impact is remote for the same reason as (b) above.

(f) Recreational fishing in estuarine areas - Likelihood of impact is remote.

(g) Recreational use of shorelines and beaches - Edge Moor wastewater contains no constituents which would interfere with these uses. Further, possible southwesterly drift, while advecting waste generally shoreward, would also dilute the wastewater so greatly that it could not be detected in any shoreline area, nor could it have any adverse impacts.

(h) Commercial navigation - Dispersing wastewater should not interfere with navigation. The pH of seawater-wastewater mixtures would not be corrosive if drawn into cooling or ballast systems.

(i) Recreational navigation - Same as (h) above.

(j) Actual or anticipated exploitation of living marine resources - The disposal activity will not have any impact on fishing as discussed in (a) - (f) above.

(k) Actual and anticipated exploitation of non-living resources - Mining of sand, gravel, or mineral deposits, and oil and gas exploration or production, are not carried out at the disposal site. Oil and gas exploration may be carried out near the site, but Edge Moor wastewater disposal is expected to have no impact on these activities.

The above assessment of impacts on other uses of the ocean has considered both temporary and long-term effects within state of the art, and has concluded that no irreversible or irretrievable commitment of resources would result from ocean disposal of Edge Moor wastewater. The Deepwater Industrial Waste Disposal Site is little used for purposes other than disposal, and is not particularly significant in terms of abundance of living or non-living resources relative to other open ocean areas. Effects on plankton have been observed in the immediate barge wake. These effects are short-term because the recovery or regeneration time of these organisms is short and only a small percentage of the plankton community is ever exposed to the waste. No long-term changes in the biota at the site have been observed as a result of Edge Moor wastewater disposal.